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ABSTRACT

A program at the Model Preschool Center for Handicapped Children at the University of Washington's College of Education enrolled 11 children with Down syndrome, 18-36 months of age. The program sought to accelerate and maintain the motor and cognitive skills of the children; to encourage parent involvement; to provide training to students, teachers, and paraprofessionals; and to develop a model that could be replicated in other settings. Children in the program moved through five classes: Infant Learning, three levels of Preschool, and Kindergarten, as they became developmentally ready. A study of the impact of the special program involved two comparison groups: non-participants with Down syndrome and non-Down syndrome mentally retarded children. Data suggest that the early intervention program had a positive effect on the cognitive and behavioral development of program participants, as they achieved higher scores than comparison pupils on the Peabody Picture Vocabulary Test and the Vineland Social Maturity Scale. The gains that were made at the preschool level were maintained during a subsequent year when some of the children attended a special class at a public school. A 6-year followup study of nine former program participants showed that their general mental performance was maintained, and even accelerated in some cases. (JDD)

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Cognition and the Acceleration and Maintenance of Developmental Gains among Children with Down Syndrome: Longitudinal Data

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Cognition and the Acceleration and Maintenance of Developmental Gains Among Children with Down Syndrome: Longitudinal Data*

The word cognition refers to the act, power or faculty of comprehending, processing and knowing. Cognitive development refers to the mental development that takes place as a child learns to interact with his environment with increasing understanding. In children with Down syndrome as well as in the normal population cognitive development is not an entity that can be measured in isolation. As a multidimensional facet of what might be termed intelligence cognition is linked to such behaviors as language, academic performance, and a wide range of social skills. Early affective behaviors such as smiling and laughing are also considered to be indicators of cognitive development. A number of investigators including Piaget (1972) and Sroufe and Wunsch (1972) have compared ages when smiling and laughing responses occur in infants with Down syndrome and their non-retarded counterparts. In spite of the fact that the former showed several months' delay in attaining these developmental milestones, the sequence in which these affective responses emerged in both groups of children, was similar.

Other research has examined such indices of cognition in young children with Down syndrome as attention, object permanence, sequence and organization with varying results. In some instances, the emergence of these behaviors closely paralleled that of normal children, in other cases there were marked differences.

From the point of view of the educator, however, the significance of these findings lies not in the degree of delay or non-delay displayed, but in the fact that children with Down syndrome are (1) inherently capable of cognitive development, (2) the sequence of this development follows normal patterns of growth, and (3) as research has shown, systematic programs of early education can successfully enhance and accelerate the cognitive development of these children.

January 1971 marked the beginning of such a program for children with Down syndrome. The program was housed at the Model Preschool Center for Handicapped Children at the *Experimental Education Unit* (EEU) component of the University of Washington's College of Education, Child Development and Mental Retardation Center, Seattle, Washington. The enrollment opened with eleven children with Down syndrome, 18 to 36 months of age.

The purpose of the program was to accelerate and maintain the motor and cognitive skills of these children, to encourage parent involvement, to provide training to students, teachers and paraprofessionals, and to develop a model that could be replicated in other settings, schools, homes, and institutions.

Children in the Down Syndrome Program were grouped according to age into five classes: Infant Learning; Early Preschool; Intermediate Preschool; Advanced Preschool and Kindergarten. When a child was old enough and developmentally ready, he moved up from one group to the next. Because the objectives for each group were interdependent and the teachers worked in close cooperation with each other, these transitions occurred effortlessly with no apparent disruption to the child.

In the fall of 1973, eight of the original eleven children, ranging in age from 4½ to 5 years, were ready to enter the newly formed kindergarten class. Encouraged by their progress, funding was obtained to follow these EEU pupils into the public school system when they entered a special class at Green Lake elementary school, a school serving normal and handicapped children, the following year. This six-year study became known as the Acceleration and Developmental Gains (AMDG) Project.

Two comparison groups were included in the study: children with Down syndrome who had not attended the EEU Down syndrome program, and non-Down syndrome mentally retarded children.

One of the aims of the project was to ascertain whether a continuing program modeled on the Down Syndrome Programs could help children to maintain or accelerate developmental gains and to avoid the decline in capabilities that is usually predicted for this population. The second goal was to determine the effects of early intervention on the cognitive and behavioral development over time. Specifically we wanted to know whether or not children who had early intervention would continue to show better performance than those who had not participated in our program.

Measurement of Pupil Progress

Pupil progress as a result of the classroom programming was measured using standardized instruments and a curriculum-reference test. The Peabody Picture Vocabulary Test – Forms A and B (PPVT) (Dunn, 1959) were used to assess growth in the verbal comprehension area. The Vineland Social Maturity Scale (VSMS((Doll, 1953) provided a measure of social development. The Developmental Sequence Performance Inventory (DSPI) (1977) provided curriculum-referenced data on pupil performance. For data analysis purposes, the children were divided into three subject groups: (1) EEU-DS pupils, children with Down syndrome, pupils who had enrolled in the early intervention programs at the Experimental Education Unit prior to enrollment in the Green Lake program; (2) non-EEU, pupils with Down syndrome who had not received early intervention at the EEU; and (3) non-DSMR pupils in project classes, who were mentally retarded, but not with Down syndrome. These groupings allowed comparisons which yielded some indication of the long-term effects of early intervention and the relative benefits of the project on

Down's and non-Down's pupils. In this paper only PPVT and VSMS scores are discussed.

Peabody Picture Vocabulary Test Results

The PPVT provides a standardized estimate of the children's intelligence through a measurement of their receptive language. Responses are non-oral. The test was considered to be especially appropriate for children with Down syndrome and other developmental delays, since this population's major deficits occur in the area of spoken language. A test which requires verbal responses would fail to give an accurate estimate of these children's intellectual comprehension.

The raw scores obtained on a PPVT can be converted to three types of derived scores: (2) an age equivalent (mental age); (2) a standard score equivalent (intelligence quotient); and (3) a percentile equivalent (percentile). For the purpose of this report the results will be shown in terms of IQ equivalent scores.

In order to see whether the subject children improved, maintained or decelerated in their performances as measured on the PPVT over time, entry and exist scores for all subjects were examined. Entry scores refer to scores obtained on the first PPVT test administered to the children at Green Lake. Exit scores refer to the last scores obtained on the same children. Because the time between entry and exit scores varied greatly, depending on when a child entered the project and when the last test was administered, the children and their scores were grouped according to the length of time that they had been in the program between entry and exit testing: – 1) less than 12 months), 1 year, 2 years, 3 years and 4 years. Although the AMDG project began in 1974, for different reasons, none of the original children who entered Green Lake that year remained consistently in the program through the final 1979-1980 school year and funding period. Of the original eight, one pupil died, four left the school district, other children were absent and away from the project for periods of time for reasons relating to family matters. As far as the non-EEU-DS population was concerned, by fall of 1976 about half of the children graduated out of the project. As a result the maximum number of years that any pupil remained in the program between entry and exit scores was four years. It should be understood, however, that each fall new EEU-DS graduates as well as non-EEU DS and other MR pupils entered the AMDG Project at the Green Lake school.

TABLE I

Mean entry and exit PPVT IQ equivalent scores for EEU DS, Non-EEU DS, and Non-DS MR, grouped according to years in program, mean scores and ranges, mean CA and range, mean entry and exit score for total in each group.

Subjects – EEU DS M CA for total N = 9.72

Years in Program	-1	1	2	3	4
M Entry	40	30	59	43	68
Range	13-59	8-99	24-89	12-74	48-85
M Exit	57	52	66	57	62
Range	24-77	28-95	51-77	43-73	68-71
Exit M CA	6.8	9.9	10.3	10.4	11.2
Range (age)	5-5 – 7-7	7-0 – 9-4	10-9 – 9-7	9-0 – 11-6	10-10 – 11-8
N =	5	10	4	11	4

Grand Total M entry scores 48
Grand Total M exit scores 59
Total N = 34

Subjects – Non-EEU DS M CA for total N = 11.36

Years in Program	-1	1	2	3	4
M Entry	37	38	34	39	27
Range	8-63	7-60	0-74	0-87	13-62
M Exit	37	44	38	49	58
Range	22-55	3-61	0-68	5-72	47-73
Exit M CA	10.9	10.5	12.7	11.8	10.9
Range (age)	7-9 – 15-8	5-10 – 13-7	9-1 – 15-8	10-3 – 13-4	8-10 – 12-3
N =	6	6	17	12	4

Grand Total M entry scores 35
Grand Total M exit scores 45
Total N = 45

Subjects – Non-DS MR C Ca for total N = 8.8

Years in Program	-1	1	2	3	4
M Entry	31	31	20		
Range	0-53	0-59	0-54		
M Exit	48	46	34		
Range	3-104	0-83	6-62		
ExitMCA	8.5	8.4	9.5		
Range (age)	6-10 – 11-8	6-8 – 9-8	7-7 – 10-6		
N =	10	9	9		

Grand Total M entry scores 27
Grand Total M exit scores 43
Total N = 28

The results showed that as a group the EEU-DS subjects made gains between their entry and exit scores, regardless of their length of time in the program, with one exception. The mean score for four pupils whose exit scores were recorded after four years in the program showed a loss of six points. Their score dropped from a mean PPVT IQ equivalent of 68 to 62. This small loss was not statistically significant at the .01 level.

EEU-DS children in the -1 to 3 years' interval categories showed gains ranging from 17.4 to 7.25 points.

The non-EEU-DS subjects also made gains between entry and exit testing. Generally both mean entry and mean exit scores were lower than those made by the EEU-DS group, however a spectacular gain was made by non-EEU-DS pupils who had been in the program the maximum four years. These pupils showed an improvement of 31 points, raising their low entry mean PPVT IQ score of 27 to a gratifying 58. Such results suggest that predictions for inevitable deterioration in performance among DS chidren may not be entirely valid.

The entry and exit PPVT scores made by the non-DS MR project children were also examined. Non-DS MR children first entered the Green Lake program in the fall of 1977. The maximum length of time for any of the children's scores between entry and exit was two years. The mean PPVT scores for the MR group for children who had been in the program -1, 1, and 2 years are comparable to those obtained by the non-EEU-DS children, although the MR subjects in the 2 year category scored lower than the non-EEU-DS subjects, with a mean entry score of 20 and a mean exit score of 34; compared to a mean entry and exit score of 34 and 38 respectively. The gains between testing periods, however, were greater, ranging from 14 to 17 points. Table I (see page 7) summarizes these figures by subject group, length of time in the program, entry and exit mean PPVT scores, range of individual scores, gains made, ranges in age, and mean CA for each group of children.

It can be seen from these figures that in all instances the EEU-DS group which had the earlier programming at the Model Preschool Center scored higher than either of the comparison groups, non-EEU-DS and non-DS MR.

A grouped frequency distribution of individual exit scores on the PPVT from 1 to 110, class interval 10, was made to determine what percent of children among the three subject groups fell within this hierarchy of class in-

tervals. It was interesting to note that 20% of the EEU-DS subjects (N = 34) had PPVT IQ equivalent scores in the 60-70 range. Nine pupils, 26%, scored in the 70-80 range. Only two children, 4% among the non-EEU-DS pupils (N = 45) scored in that upper range. The highest frequency for this latter group, 26%, occurred in the 50-60 range according to the PPVT IQ equivalent scores.

Most of the non-DS MR children, 36% (N = 28), scored in the 20-30 range, although one child attained a PPVT score of 110. Figure 1 illustrates these data.

The Vineland Social Maturity Scale Results

The Vineland Social Maturity Scale is one of the oldest and most extensively used scales for the measurement of social development, *e.g.* adapative behaviors. The recommended uses for the scale include "measurement of growth or change, individual differences, variations in development, improvement following training, and reviewing developmental histories" (Sailor & Horner, 1976). Moreover, the Vineland Scale was standardized with non-handicapped children; therefore it is possible to examine the performance of our project children in terms of how they would compare to a normal peer age group.

The Vineland is administered by directing test items not to the child, but to third person informants such as parents or teachers. Since the accuracy of the measurement depends upon the skill of the interviewer and the informant's knowledge or awareness of how a child is functioning, results must be interpreted with this variable in mind. For the purposes of this report test scores were reported in terms of Social Quotient (SQ).

Once again, as with the measured performance on the PPVT, entry and exit VSMS scores were examined. And, again it was necessary to take into account the fact that subjects entered or left the program at different times, with none remaining longer than four years. In order to adjust for these discrepancies the subjects and their individual entry and exit score were grouped according to the length of time in the program, from less than a year to four years.

TABLE II

Mean entry and exit VSMS social quotient scores range in individual scores, mean CA's and range in age and years in program for EEU DS, Non-EEU DS and Non-DS MR subjects.

Subject – EEU DS N = 30 MCA = 9.2

Years in Program	-1	1	2	3	4
M entry SQ	72	77	87	72	87
Range	60-97	53-105	45-108	52-100	47-112
M exit SQ	81	72	72	71	75
Range	68-88	52-90	55-82	68-87	72-82
M CA	7.3	7.9	10.3	9.5	11.2
Range	6-10 – 7-5	7-2 – 9-4	9-7 – 10-5	9-0 – 11.6	10-10 – 11-8
	N = 4	N = 6	N = 4	N = 12	N = 4

Grand Total M entry = 79.16 Grand Total M exit = 74.2

Subjects – Non-EEU DS N = 44 MCA = 11.5

Years in Program	-1	1	2	3	4
M entry SQ	63.7	65	87	68	
Range	27-115	39-80	75-92	39-99	
M exit SQ	64.5	52	69	57	
Range	23-95	25-82	58-76	33-76	
M CA	10.3	13.04	11.8	11.1	
Range	7-8 – 15-9	12-0 – 14-1	9-2 – 12-2	10-0 – 12-4	
	N = 7	N = 23	N = 5	N = 9	N = 0

Grand Total M entry = 70.8 Grand Total M exit = 60.8

Subjects – Non-DS MR N = 28 MCA = 9.2

Years in Program	-1	1	2	3	4
M entry SQ	57	55	54		
Range	25-116	21-111	20-109		
M exit SQ	60	61	47		
Range	38-111	13-106	21-105		
M CA	9.7	9.3	8.6		
Range	6-10 – 16-2		6-8 – 11-6		
	N = 14	N = 8	N = 6	N = 0	N = 0

Grand Total M entry = 55.3 Grand Total M exit = 56

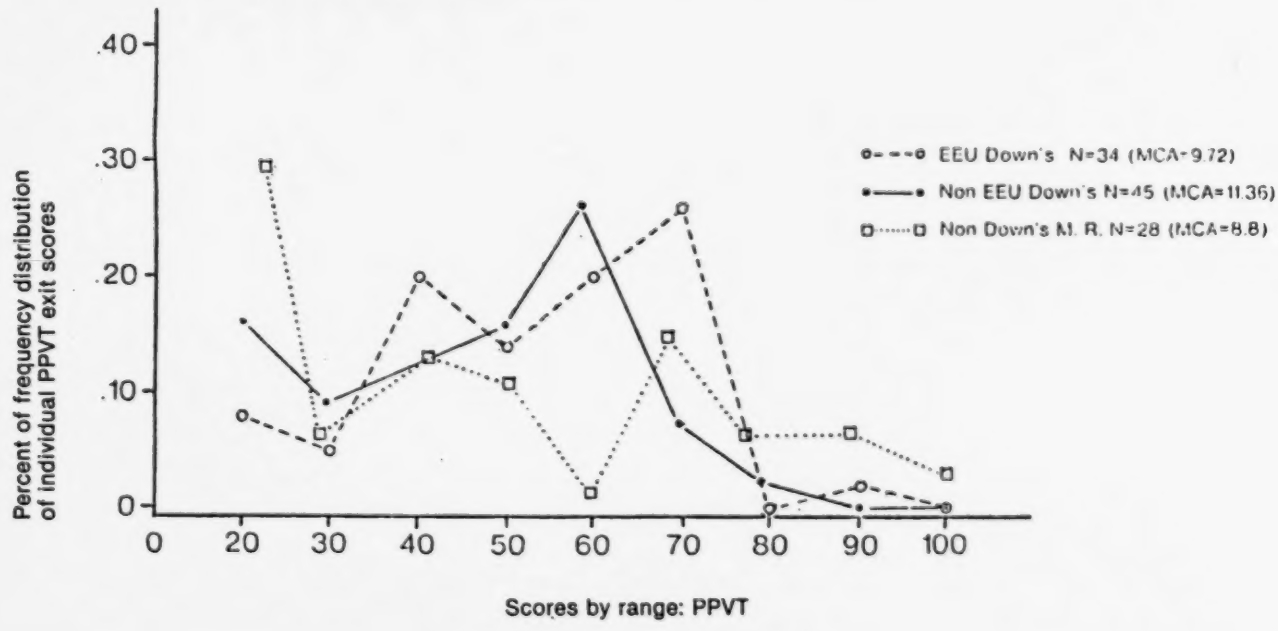


TABLE III

Data From the DuVerglas Follow-up Study

	Age* as of 1/83	Stanford-Binet IQ	Stanford-Binet Mental Age	PPVT IQ	PPVT Mental Age	WRAT Grade Level	WRAT Reading Age**
	years/ months		years/ months		years/ months		years/ months
***Dirk	14/10	43	5/7	47	5/1	2-2	7/2
S-1	14/3	59	7/8	66	7/10	4-1	9/1
***Karen	15	45	6/2	60	7/5	3-8	8/8
S-2	13/6	52	6/8	71	8/6	6-9	11/9
S-3	14/8	46	6/2	49	5/6	2-5	7/5
S-4	14/3	52	6/8	56	6/1	2-7	7/7
Means	14/5	49.5	6/6	58.2	6/9	3-6	8/6

*Stanford-Binet, PPVT, and WRAT were administered at various times throughout the school year. Age as of 1/83, not exact age of each testing.
**Calculated from grade level to age, e.g., 1st grade, 6th year, etc.
***Not included in Table IV.

TABLE IV

Comparison of 1983 and 1987 PPVT Follow-up Data on Four Subjects

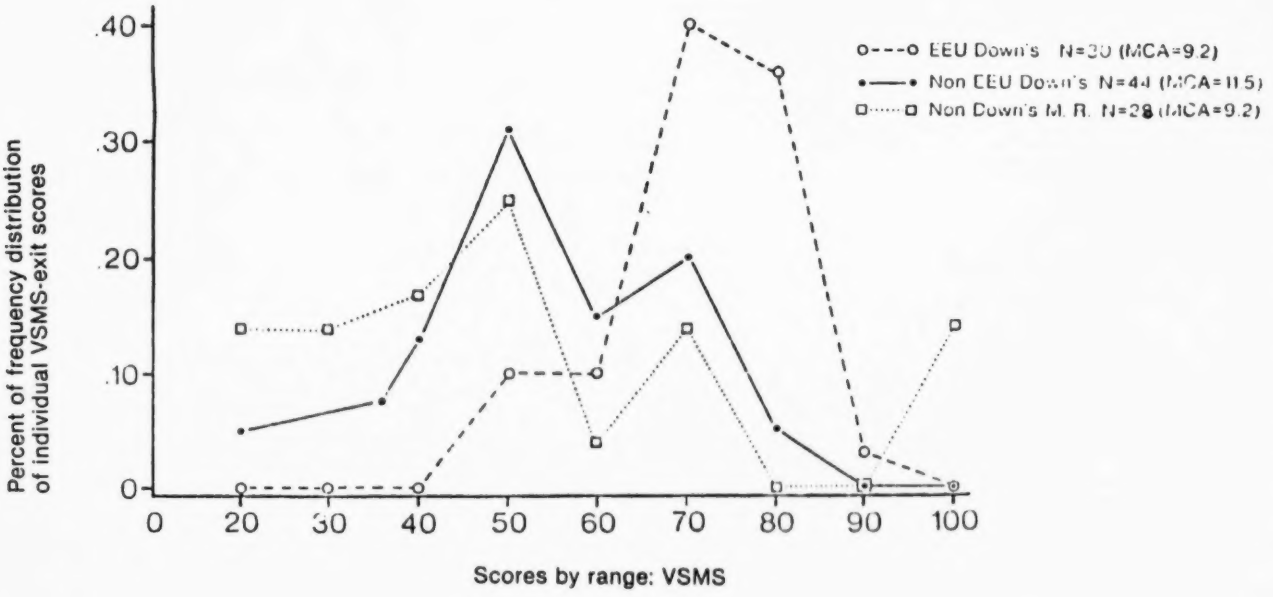
	1984 CA years/months	PPVT(IQ)	MA years/months	MA as % of CA
S-1				
1983	14/3	66	7/10	54%
1987	18/9	70	11/5	59%
S-2				
1983	13/6	71	8/6	62%
1987	18/2	58	9/1	55%
S-3				
1983	14/8	49	5/6	38%
1987	19/3	51	7/3	39%
S-4				
1983	14/8	49	6/1	42%
1987	18/11	49	7/10	41%
Means	CA years/months	PPVT	MA years/months	MA as % of CA
1983	14/2	59	6/9	49%
1987	18/7	56.5	9/3	48%

The results showed that regardless of the length of time in the program, the EEU-DS children scored higher than either of the comparison groups, non-EEU-DS and non-DS MR. Individual entry and exit VSMS SQ scores for group 1 ranged from 72 to 87, and from 81 to 75. The mean entry and exit scores for these EEU-DS scores were 79.16 and 74.2 respectively. The individual entry and exit scores for non-EEU-DS subjects ranged from 63.7 to 87, and from 52 to 69. The individual SQ entry and exit scores for the non-DS MR subjects ranged from 54 to 57 and from 47 to 61. The mean entry and exit scores for these two subject groups were 70.8 and 60.8 (non-EEU-DS) and 55.3 and 56 (non-DS MR). The exit scores for all three groups showed a slight deceleration, none of the differences between entry and exit scores, for any of the groups was statistically significant.

Table II summarizes these data, by subject group, length of time in the program, entry and exit mean SQ scores range of individual score, ranges in age and mean CA for each group of children. A mean CA at time of exit and mean exit score for the entire number of children in each subject group are also given.

Although it was disappointing that some decline occurred between entry and exit figures, especially a loss of 15 points among the EEU-DS children who had been in the program for two years, statistically the difference between the mean entry score of 87, and M exit score of 72 was not significant at the .100 level.

A group frequency distribution of individual VSMS exit scores from 0-100, class interval 10, was made to determine what percent of children among the three subject groups fell within this hierarchy of class intervals. It was found that the majority of the EEU-DS (total N = 30) children achieved VSMS SQ scores in the 70-80 and 80-90 ranges, 40 and 36 percent respectively. Only three children, 10 percent, in each case scored in the 50-60 and 60-70 ranges. None received VSMS SQ below 50. The majority of the non-EEU-DS children (total N = 44), 32 percent, had scores in the 50-60 range, 14 percent had scores in the 40-50 range and only two children out of 44 attained the 80-90 category compared to 11 EEU-DS children who performed at this level.



Although the majority of the non-DS MR (total N = 28), 25 percent, also scored in the 50-60 range, there were also a number of cases at either end of the distribution, 14 percent occurred in the 0-20 range, and another 14 percent at the 100-110 level (see Figure 2).

Overall the performance of the entire Down syndrome population was gratifying as it showed better than expected achievement.

According to Cornwell and Birch (1969), in the Down syndrome children there is "both a developmental lag and an arrest of certain psychological and social capacities." For instance, at age nine years, a child with Down syndrome with an IQ score of 35 (Stanford-Binet) will have a Social Quotient (Vineland) of 45. Smith and Wilson (1973) also discuss the relative levels of performance on intelligence and social performance tests. Both IQ and SQ scores decline; however, SQ scores remain about 10 points above IQ scores.

Our reported data show, however, that former EEU-Down syndrome pupils are performing at considerably higher levels on the Vineland than predicted for either their CA or MA (IQ) as suggested by both Cornwell and Birch and Smith and Wilson. The mean exit score on the PPVT indicated an IQ equivalent of 59 and the mean SQ was 74.3, a difference of over 15 points. Cornwell and Birch report an average IQ of 35 and an SQ of 42 for comparably aged children.

Zigler and Trickett (1978) argue that social competence rather than IQ should be the primary measure of the success of intervention efforts. If so, then the superior EEU-Down's pupils' performance on the Vineland Social Maturity Scale – although not statistically significant – may still reflect the effects of the early intervention that the former EEU pupils received. The non-EEU-Down syndrome children, although not demonstrating as spectacular gains, also exceeded both IQ and SQ score findings reported by Cornwell and Birch for their chronological age (IQ 45 as opposed to IQ 36; SQ 61 as opposed to SQ 54).

Results

The data generated by our project suggest that early intervention had a positive effect on the cognitive and behavioral development of the EEU-DS children. These subjects consistently achieved higher PPVT and VSMS scores, upon entry as well as upon exit from the project, than the comparison pupils. These findings indicated that the gains that were made at the pre-school level were maintained during the period that these children were in the AMDC public school program. The data also showed that participation in the project had, in most instances, a positive effect upon the development of the subjects in the two comparison groups. Two non-EEU-DS pupils increased their PPVT scores from 13 and 5 to 73 and 61 after four years in the program. One non-DS MR child increased his score from 23 to 61 in less than one year. Another non-DS MR child improved dramatically, within one year, from 39 to 104. These results suggested that the children's previous educational experience may have been inadequate.

From the data gathered thus far, it is, of course, impossible to predict how the experimental group would have progressed in some other public school program. Nevertheless evidence showed that early education accelerated the development of Down syndrome children. The EEU-DS subjects performed at higher cognitive and behavioral levels than did their peers who did not participate in our model infant and preschool program.

Follow-up

In 1983, three years after the preceding data were reported, six subjects who had participated in the AMDG Project and who were among the original eleven pupils to enter the EEU Program in 1971 were administered the Stanford Binet (1973), the PPVT, and the reading section of the Wide Range Achievement Test (WRAT) (Jastak, Bijou and Jastak, 1965, revised 1978; DuVerglas, 1984). The M age for these EEU subjects (three males and three females) was 14 years, 1 month. Five were attending an integrated junior high school, one boy was attending a special education school. Their mean test scores were as follows: Stanford Binet IQ, 49.6, range 43-59; PPVT equivalent IQ, 58.2, range 47-71. The WRAT showed a mean grade reading level of 3rd grade, 6 months, ranging from a 2nd grade, 2 months level to a 6th grade, 9 months level. Table III summarizes the data.

In July of 1987, nine former EEU-DS subjects were interviewed and administered the PPVT (Form M, revised, 1978; Dmitriev, 1987). The results showed that seven of these former pupils, M CA 17 years, 9 months, achieved an M PPVT score of 57.4, ranging from 47-71. The score was similar to that reported by DuVerglas in 1984. The raw scores for two of the nine students tests did not yield PPVT equivalent IQ scores. Their performance will be discussed later in this paper. Six of the nine subjects, including the two students who failed to achieve PPVT scores, participated in the 1983 follow-up study. Table IV compares the 1983 and 1987 PPVT follow-up data on the four subjects who participated in both studies.

It can be seen from Table IV that, except for S-2 whose 1987 score of 58 is lower than his earlier score, the overall performance showed little change. It must be remembered, however, that the subjects are now four years older, and consequently must attain higher raw scores in order to maintain or approximate their previous PPVT scores. For this reason the mental ages and the mental ages as a percent of the subjects' chronological ages are reported. By studying these figures it can be seen that their general mental performance has been maintained, and even accelerated in some cases. For example, the 1983 M MA was 6 years, 9 months, as compared to the 1987 mean of 9 years, three months, showing that the subjects were performing at 49 and 48 percent of their actual ages.

As reported earlier, two subjects, Dirk and Karen received raw scores that were too low to convert to PPVT equivalent IQ scores. In 1983, the boy, CA 14 years, 10 months, received a PPVT score of 47 with an MA of 5 years, 1 month. According to these figures he was functioning at 34 percent of his chronological age. At the time of his 1987 testing he had a CA of 19 years, 3 months, with an MA of 5 years, 4 months. It would appear that Dirk was functioning mentally at approximately the same level as before, but the fact that he was now four years older, placed his current MA at 28 percent of his present age.

There are, however, facts that may explain Dirk's low performance. Since early childhood this young man has had a severe hearing loss. As a result when the EEU-DS subjects left Green Lake Elementary School to enter an integrated junior high school, Dirk was unable to keep up, and began attending a special education school. This, undoubtedly, was a realistic placement for this young boy. The classes are small and more emphasis is placed on vocational training than on academic instruction. In spite of his limited speech, Dirk is a very pleasant, responsive, good-looking young man. He is exceptionally well coordinated. He participates in Special Olympics and has won many prizes for his running ability. It may be significant that Dirk's karyotype shows an unusual form of mosaicism, referred to as a "ring mosaic." It is impossible

to say what effect this anomaly has had on his mental development, although as an infant and preschooler he appeared to be advanced for a child with Down syndrome.

It is hard to understand why Karen, who received a PPVT score of 60 on her 1983 test, failed to score on a similar test four years later, or why her previous MA of 7 years, 5 months, dropped to 6 years, 9 months. In every other respect Karen is functioning at a very high level. Karen is now a relatively tall, slender, 19 year-old woman, with an attractive figure and long red hair. She has excellent speech, attends high school with other EEU-DS students and participates in many social and physical activities. She enjoys folk-dancing, plays the piano and sings; she also swims and skis. Last summer she and three EEU-DS girls, who were not included in the study spent four weeks working at a summer camp. They cleaned, painted and did general maintenance work. About a year ago Karen lost all function of her thyroid gland; daily medication enables her to maintain normal thyroid levels. One can only speculate what effect, if any, this medical problem had on her test performance.

Discussion

All in all the follow-up of these nine former EEU pupils has been a gratifying experience. It was interesting to find so little change between the mean PPVT score of 59, reported in 1980, and the 1987 findings, PPVT M 57.4 Compared to the expectations that were held for this population twenty years ago, one can only marvel at what has been achieved through early intervention and education. In the final analysis, test scores are not important. As yet there are no tests that can measure the quality of life, or what these young people have achieved in terms of human dignity, social and vocational worth.

Except for Dirk, and a younger subject who is still in junior high, seven of the nine follow-up students attended a self-contained class in a regular high school They study language arts, civics, computer science, horticulture, life skills, home economics, and art. One boy graduated this summer; the remaining six will begin their senior year. They all participate in numerous social, cultural, and sport activities with each other and with normal peers. Dancing, swimming, music, television, as well as reading and visits to the library are favorite pastimes. Four subjects, in addition to Karen and her three friends, are holding summer jobs, earning competitive wages. Future plans include continued vocational and academic training at a community college and independent living.

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Editor's Note: This paper is a most important piece of work. Although it is impossible to comment on individual cases without full medical review, the results on the two Down's syndrome children, Dirk and Karen, are of general interest. If these children had attended a Down syndrome clinic practicing preventive medicine on an annual basis, their medical problems might have been identified earlier and any possible adverse effect on cognitive development ameliorated or even prevented.

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